REMARKS

The Examiner is thanked for the thorough review of the present application. Independent claim 4 has been amended to include the limitations of dependent claim 9 in independent form. Dependent claims 8 and 9 have been cancelled, for consistency with this amendment. No new issues are presented by this amendment. MPEP §706.07(a).

Claims 4-7 are currently pending and presented for examination. The Examiner has rejected claims 4-7 under 35 U.S.C. §103(a) as being unpatentable over Levy et al. in view of Hamanaka. Applicants respectfully request reconsideration and allowance of the pending claims in view of the following remarks.

Rejection of Claims 4-7 under 35 U.S.C. §103(a)

Amended independent claim 4 (dependent claim 9) was rejected as being unpatentable over Levy et al. in view of Hamanaka. Amended independent claim 4 recites an optical waveguide for guiding optical signals, where the optical waveguide has a number of breaks relative to a propagation direction of the optical signals. Amended independent claim 4 further recites a plurality of modules plugged into a slot assigned to each break, where each module includes a coupling unit for coupling the optical signals to the respective module, and each coupling unit includes a first and second optical waveguide part. Amended independent claim 4 further recites that one end of the first optical waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and that one end of the second optical waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction. Amended independent claim 4 further recites that one of the inserted modules is a master module for the remaining modules, and that the master module communicates via the optical waveguide to check if a valid address has been assigned to the remaining modules. Neither Levy et al., Hamanaka, or any cited prior art reference discloses these recitations, and accordingly, amended independent claim 4 is patentable.

Levy et al. discloses an optical-interconnect housing system 60 (see FIG. 6a), including an optical fiber 51 which is inserted into a docking port 42a of an optical connector housing 33 (Col. 3, lines 26-30). The optical connector housing 33 includes a partially-reflective mirror 63 to direct light from the optical fiber 51 through a light pipe 54 and into an optical

transmitter/receiver 61 of the optical connector housing 33 (Col. 3, lines 28-32). Light may be re-transmitted by the optical transmitter/receiver 62 through a light pipe 53 and to a partially-reflective mirror 64 of the optical connector housing 33, before entering the optical fiber 52, which is inserted into a docking port 42b of the optical connector housing 33 (Col. 3, lines 37-40). Levy et al. expressly teaches that "the optical fiber ribbon docking ports 42a and 42b, mirrors 63 and 64, and light pipe or lenses 53 and 54 form the optical connector 33." (Col. 3, lines 42-44)(emphasis added). Thus, since the optical fibers 51,52 are inserted into the optical connector housing 33, along the propagation direction of the optical signals through the optical fibers 51,52 (see FIG. 6a), the break between the optical fibers 51,52 is less than the dimension of the optical connector housing 33, in the propagation direction of the optical signals through the optical fibers 51,52.

The Examiner conceded that Levy et al. fails to disclose a plurality of modules plugged into a slot assigned to each break, where each module includes a coupling unit for coupling the optical signals to the respective module, and each coupling unit includes a first and second optical waveguide part, as recited in amended independent claim 4. Additionally, the Examiner conceded that Levy et al. fails to disclose that one end of the first optical waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and that one end of the second optical waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction, as recited in amended independent claim 4. The Examiner looked to Hamanaka to provide these noted deficiencies, and cited to FIGS. 4-5, 16f, 18, and col. 1, lines 15-20; col. 4, lines 53-55; col. 6, lines 3-6; col. 7, lines 48-52; col. 8, lines 12-19; col. 9, lines 15-23 and col. 14, lines 13-67, in support thereof.

Hamanaka discloses a motherboard 20 (FIGS. 4-5) with "a plurality of straight slots 20a defined between the spaced rows of distributed index rod lenses 2, for receiving a plurality of respective electronic circuit boards 10" (Col. 6, lines 3-6). Each circuit board 10 resembles the circuit board 11 illustrated in FIG. 1, having an optical sensor array 31 and an SLM 32 "arranged in a plane normal to the applied light A (FIG. 2), with the optical sensor elements and the SLM elements being aligned with each other in one-to-one correspondence." (Col. 4 line 66 – Col. 5 line 2). The optical sensor array 31 is "for absorbing and photoelectrically converting several % of applied light into an electric signal to detect the intensity of the applied light, and for transmitting the remainder of the applied light therethrough" (Col. 4, lines 57-61), and the SLM

array 32 is "for modulating the transmittance with respect to the applied light" (Col. 4, lines 63-64). The electronic circuit boards 10 of FIGS. 4-5 are "inserted in the slots for transmitting optical information between the electronic circuit boards 10." (Col. 6, lines 8-9). The rod lenses 2 are oriented "normal to their optical axis 2A," and thus both the rod lenses 2 and the electronic circuit boards 10 are oriented normal to the applied light. Hamanaka also teaches (see FIG. 14) an SLM unit 81 positioned within the gap 20a, where the substrate 82 of the SLM unit 81 "have a pair of outer parallel flat surfaces" (Col. 12, lines 58-59). Hamanaka also illustrates a variation of the embodiment of FIG. 14 in FIG. 16f, where the "optical/optoelectronic components are of uniform thickness and each have a pair of parallel surfaces" (Col. 13, lines 27-28). Additionally, FIG. 18 of Hamanaka discloses a prism 93 "aligned and fixed with respect to an optical system" such that the prism 93 is "held in contact with wall surfaces" of the slot 2B (Col. 14, lines 56-64). The refractive indices of the prism 93 and slot 2B are matched, to ensure that light within the rod lenses 2 passes undeflected through the prism 93 (FIG. 18). The prism 93 includes an internal "reflecting surfaces" such that "light emitted from the optical fiber array 95" is internally reflected within the prism 93 "to enter the coaxial lens array." (see FIG. 18; Col. 14, lines 23-27).

As discussed above, the Examiner contended that FIGS. 4-5, 16f and 18 of Hamanaka, in addition to the cited portions above, disclose a plurality of modules plugged into a slot assigned to each break, where each module includes a coupling unit for coupling the optical signals to the respective module, and each coupling unit includes a first and second optical waveguide part, as recited in amended independent claim 4. Additionally, the Examiner contended that FIGS. 4-5, 16f and 18 of Hamanaka disclose that one end of the first optical waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and that one end of the second optical waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction, as recited in amended independent claim 4. However, as discussed above, Hamanaka actually teaches that the circuit board 10 inserted within the slots 20a includes an optical sensor array 31 and SLM 32 which are "arranged in a plane normal the applied light A" (Col. 4, line 66)(see FIGS. 2, 4-5). Thus, the sensor array 31 and SLM 32 are not a coupling unit including a first and second optical waveguide part, where one end of the first waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and one end of the second waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction,

as recited in amended independent claim 4. Additionally, the optical sensor array 31 and SLM 32 are merely used to absorb a portion of the incident light through the lenses 2, and transmit the remainder through to the adjacent lens 2, and thus are "inserted in the slots for transmitting optical information between the electronic circuit boards 10." (Col. 6, lines 8-9). Indeed, the optical sensor array 31 and SLM 32 are not a coupling unit including a first and second optical waveguide part, where one end of the first waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and one end of the second waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction, as recited in amended independent claim 4.

Additionally, as discussed above, Hamanaka also teaches (see FIG. 14) an SLM unit 81 positioned within the gap 20a, where the substrate 82 of the SLM unit 81 "have a pair of outer parallel flat surfaces" (Col. 12, lines 58-59) and a variation of the SLM unit in FIG. 16f where the "optical/optoelectronic components are of uniform thickness and each have a pair of parallel surfaces" within the gap 20a (Col. 13, lines 27-28). As illustrated in FIG. 16f, incident light is transmitted undeflected through the optical component positioned within the slot. Indeed, as with the optical sensor array 31 and SLM 32 above, the optical components of FIG. 16f include "a pair of parallel surfaces" within the gap, and facilitate transmission of light through the lenses 2 along the optical axis 2A (see FIG. 16f). Thus, the optical components illustrated in FIG. 16f are not a coupling unit including a first and second optical waveguide part, where one end of the first waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and one end of the second waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction, as recited in amended independent claim 4.

Additionally, as discussed above, Hamanaka discloses a prism 93 (FIG. 18) "aligned and fixed with respect to an optical system" such that the prism 93 is "held in contact with wall surfaces" of the slot 2B (Col. 14, lines 56-64). The refractive indices of the prism 93 and slot 2B are matched, to ensure that light within the rod lenses 2 passes undeflected through the prism 93 (FIG. 18). The prism 93 includes an internal "reflecting surfaces" such that "light emitted from the optical fiber array 95" is internally reflected within the prism 93 "to enter the coaxial lens array." (see FIG. 18; Col. 14, lines 23-27). Thus, the prism 93 is not a coupling unit including a first and second optical waveguide part, where one end of the first waveguide part has an oblique

end face for completely coupling out the optical signals from the optical waveguide, and one end of the second waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction, as recited in amended independent claim 4. Instead, the prism 93 does not completely couple out incident light from the rod lenses 2, and allows light to pass undeflected through the prism 93, into the adjacent rod lenses 2 (see FIG. 18). Indeed, instead of coupling light out of the rod lenses 2, and coupling the light back into the rod lenses 2, the prism 93 merely permits light to pass through undeflected.

Indeed, neither the Levy et al., Hamanaka, or any other cited prior art reference, discloses a coupling unit including a first and second optical waveguide part, where one end of the first waveguide part has an oblique end face for completely coupling out the optical signals from the optical waveguide, and one end of the second waveguide part has an oblique end face for coupling the optical signals into the waveguide in the propagation direction, as recited in amended independent claim 4. Accordingly, amended independent claim 4 is patentable.

The cited portions of Hamanaka provided by the Examiner do not disclose the recitations of amended independent claim 4, and include discussions such as: the optical interconnection of circuit boards (col. 1, lines 15-20); the coating of a glass substrate with an AR coating (col. 4, lines 53-55); the alignment of "straight slots" 20a to receive circuit boards 10 (col. 6, lines 3-6); an inversion of images (col. 7, lines 48-52); how an optical transmitting device functions as a "bus" (Col. 8, lines 12-19); techniques of lens focusing and fourier transform planes (col. 9, lines 15-23); and the teachings of the prism 93 already mentioned (col. 14, lines 13-67).

The Examiner contended that Levy et al. discloses that one of the inserted modules is a master module for the remaining modules, and that the master module communicates via the optical waveguide to check if a valid address has been assigned to the remaining modules, as recited in amended independent claim 4 (dependent claims 8-9), and cited to FIGS. 5, 6a, 6b and col. 3, lines 6-67 and col. 4, lines 1-57 in support thereof. However, these portions of Levy et al. merely disclose that if an optical transmission through the optical fiber 51 (see FIG. 6a) is "addressed" to a particular DIMM 31, the "appropriate action reaches the memory devices 12 on the DIMM 31" (Col. 3, lines 32-33). Additionally, "if the optical transmission received by the DIMM 31 is addressed to a different DIMM device, or other agent, then the optical transmission is re-transmitted..." (Col. 3, lines 34-37). Thus, Levy et al. emphasizes that the unintentionally addressed DIMM 31 merely arranges for re-transmission to the properly addressed DIMM. Levy

et al. never discloses that one particular DIMM communicates using the optical waveguide 51 to determine that all of the other DIMM's are assigned a valid address. In fact, Levy et al. presumes that all of the DIMM's are assigned a valid address. Indeed, Levy et al. fails to disclose that one of the inserted modules is a master module for the remaining modules, and that the master module communicates via the optical waveguide to check if a valid address has been assigned to the remaining modules, as recited in amended independent claim 4. Accordingly, amended independent claim 4 is patentable for this reason alone.

In view of the above, amended independent claim 4 is patentable. Furthermore, in view of the patentability of amended independent claim 4, it is also submitted that all of their dependent claims, that recite yet further distinguishing features, are also patentable. These dependent claims require no further discussion herein.

Conclusion

For the foregoing reasons, it is respectfully submitted that the rejections set forth in the outstanding Office Action are inapplicable to the present claims. Accordingly, Applicants respectfully request that the Examiner reconsider the rejections and timely pass the application to allowance. Please grant any extensions of time required to enter this paper. The commissioner is hereby authorized to charge any appropriate fees due in connection with this paper or credit any overpayments to Deposit Account No. 19-2179.

Respectfully submitted,

Dated: July 28, 2009

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